

# Novel, Functionally Graded PIP Coating System for Hot Structures, Phase I

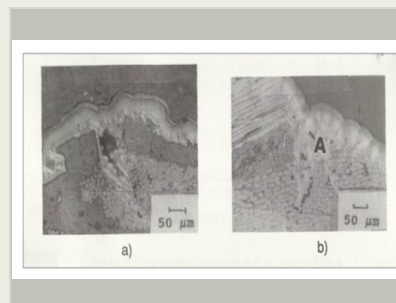
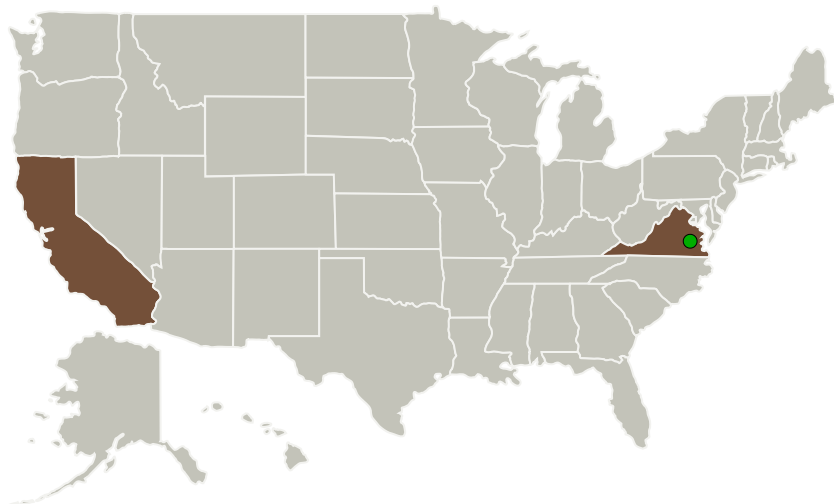
Completed Technology Project (2017 - 2017)



## Project Introduction

This proposal addresses some of the most challenging materials issues with respect to Hot Structures, very high temperature, up to 4000 degrees F, applications. The very successful, record breaking, NASA led X-43A hypersonic flight proved the ability to use state of the art (SOTA) material/coating system for short duration, single mission, and very high temperature applications. The issues associated with the leading edges are quite different from the Hot Structures issues where transverse properties are very critical and the longer duration time with much wider temperature distribution can be expected. Also the shear component size makes the application of CVD based coatings impractical. Allcomp proposes an extremely innovative solution to this problem by using functionally graded (FGM) PIP coatings to alleviate interfacial shear stresses and greatly reduce transverse thermal cracking, which historically have plagued ceramic coatings applied to very low thermal expansion coefficient 2-D and 2.5 D C-C composite substrates. The success of this Phase I will totally open new avenues in the area of high temperature materials. That, in turn, will enable NASA designers to implement hot structure solution in lieu of parasitic passive insulation system, resulting in significant weight reduction in future NASA Space Exploration vehicles, as well as a plethora of other applications.

## Primary U.S. Work Locations and Key Partners



Novel, Functionally Graded PIP Coating System for Hot Structures, Phase I Briefing Chart Image

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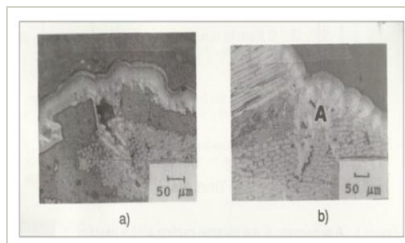


Organizations Performing Work	Role	Type	Location
Allcomp Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

## Primary U.S. Work Locations

California	Virginia
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## Images



### Briefing Chart Image

Novel, Functionally Graded PIP Coating System for Hot Structures, Phase I Briefing Chart Image  
(<https://techport.nasa.gov/image/131312>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Allcomp Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

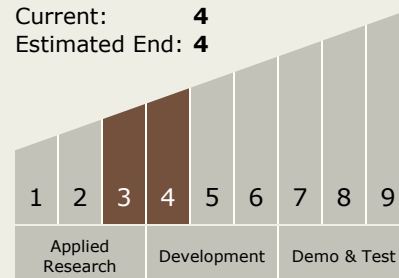
Carlos Torrez

### Principal Investigator:

Jeremy Thornton

## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



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## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.1 Materials
    - └ TX12.1.1 Lightweight Structural Materials